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Methods of Financial Engineering: Strategy on Locking Periods

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Abstract

From the perspective of financial engineering, this article conducts empirical tests towards the impact of China's A Stocks' Reform (unlocking the non-tradable stocks) using event study method and finds positive and negative abnormal returns under different conditions. Such reform has a great effect on individual stocks. However, it is difficult to predict bullish or bearish solely on 'style', such as industries, market capitalization, unlocking ratio and the size of the shareholders. A hedge portfolio based on shareholders and unlocking ratio does not bring significant abnormal returns.

Keywords: financial engineering; unlocking ratio; long-short hedge portfolio

1. Instruction

Based on classical financial theory, stocks change systematically with supply shock. International research achievements have revealed that a remarkable negative abnormal return surfaces around supply shock event days. China's A share market has formed large quantities of stocks with locking periods after reform of non-tradable shares. These stocks bring about large-scale supply shock when the non-tradable ban is lifted. This article focuses on analyzing the impact on supply shock as lock-up periods expire and whether investors can benefit from these events.

Despite having not experienced reform of non-tradable shares, western countries also have lock-up periods, which lead to supply shock likewise. Ofek and Richardson (2000)[1] looked into 1056 sample data between 1996 and 1998 and discovered a long-term cumulative abnormal return of -1.15% to -3.29% and a trading volume increase of 38% on the event day and four days before. Field and Hanka (2000)[2] conducted research on 1948 IPO sample data in lock-up periods from 1988 to 1997 and revealed that share price had fallen by 1.5% averagely in three days before and after the lock-up period. Also, they found that share price of companies invested by venture capital fell more drastically than that of others.

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Liang Hongyun (2002)[3] found certain stocks enjoying evidently average abnormal return of -1.93% on lock-up expiration day and countered no reversal in a month .Fan Xiaoyun and Shao Xinjian in Nankai University suggest that share price make slow but lasting reaction to this lock-up expiration which can be anticipated. Shareholders sell out non-tradable stocks, which adds to stock supply and thus trading volume increases persistently.

2. Sample selection and research methodology

This article utilizes data of all companies with lock-up periods between 2006 and 2009 from Wind Info, excluding (1) stock suspension on event days, (2) more than five days' suspension around event days, (3) 28 samples inaccessible to effective market data with time limitation. The research has 2449 valid samples finally, recording every unlocking day as a single sample for companies with several lock-up periods.

The Market Model used as the benchmark to calculate the abnormal return indicates that the abnormal return on a certain day can be derived from the equation:

$$AR_{\mathrm{t}} = R_{it} - \beta R_{mkt} \tag{1}$$

Meanwhile, the cumulative abnormal return through t days is calculated by

$$CAR_T = \sum_{t=0}^{T} AR_t \tag{2}$$

Foreign literature shows that supply shock can cause evidently negative abnormal returns. Firstly, we took an overall examination of A share market and observe whether similar phenomenon exists. Next, we use unlock percentage, largest shareholder involvement, and industries turn as sorting indicators to construct hedge portfolios and test their capability of earning a prominent CAR. In addition, starting point is set to be -20 day while holding periods are -1 day, T day, and +5 day.

3. Research findings

3.1. Overall test results (test results of all samples)

Table 1 Cumulative Abnormal Return of 20 days before the event

CAR of (-20) day			
closing day	-1	T	5
Average	-0.00905	-0.00301	-3.5E-05
Standard deviation	0.144085	0.149695	0.164834
t value	-0.06279	-0.02008	-0.00021

That is, we obtain 0.9% abnormal returns if we close our positions on -1 day; 0.3% if we close on T day, nearly no abnormal returns if we close on 5 day. In consideration of transaction costs, the strategy of a short sale is ineffective in A share market. The T value in the above table is also statistically indistinctive.

There are two reasons here. First, the unlock date is known to public and this information might have been contained in the current share price. Second, shareholders, compared with retail investors, are more familiar with the operation of their companies. If they don't reduce their holdings on unlock day, it means they are confident with their companies, which can be regarded as a signal of stock rising. Therefore, abnormal returns when stocks are unlocked are related to companies' operations and thus cannot be generalized in the same way.

Even though the overall average does not demonstrate a satisfactory result, we have found great cumulative abnormal returns in some stocks as 70% in positive ones and -40% in negative ones. This result illustrates that unlocking no-tradable stock increases the risk of price fluctuation.

3.2. Examination of long-short hedge portfolio results

(a) According to unlock ratio，buy long if the stock has a less than 5% unlock ratio，sell short if the ratio is more than 5%.

Existed research shows that the bigger the unlock ratio is, the larger impact it has on share price. Hence, we built up this hedge portfolio – buy long if the stock has a less than 5% unlock ratio and sell short if the ratio is more than 5%. There are 735 samples whose unlock ratio is less than 5% and 1714 samples whose unlock ratio is more than or equal to 5% .The final results, as illustrated in the following table, shows that this strategy cannot bring about evidently abnormal returns.

Table 2 results of long-short hedge portfolio according to unlock ratio

	CAR (-20:-1)	CAR (-20:0)	CAR (-20:+5)
buy long portfolio: unlock ratio less than 5%			
Average	-0.00022	0.004755	0.008001
Standard deviation	0.148423	0.152676	0.163957
sell short portfolio: unlock ratio more than 5%			
Average	-0.01106	-0.00451	-0.00227
Standard deviation	0.138594	0.144928	0.164104
overall returns	0.010843	0.009265	0.010274
t value	0.053394	0.044013	0.044291

(b) According to unlocking shareholders, buy long if the unlock shareholder is the largest one and sell short if not.

In fact, many people think that the largest share holder has little motivation to reduce their holdings, so in the next step we set our portfolio according to whether the unlock holder is the largest -- buy long if the unlock shareholder is the largest one and sell short if the unlock shareholder is not the largest one. Final results are as follows:

Table 3 results of long-short hedge portfolio according to shareholders

	CAR (-20:-1)	CAR (-20:0)	CAR (-20:+5)
buy long portfolio：the unlock shareholder is the largest			
Average	-0.00926	-0.00312	0.002396
Standard deviation	0.136335	0.142728	0.15886
sell short portfolio: the unlock shareholder is not the largest			
Average	-0.03517	-0.02953	-0.02532
Standard deviation	0.130002	0.136011	0.152594
overall returns	0.025909	0.026402	0.027719
t value	0.137534	0.133915	0.125837

Statistic results show that the maximum portfolio return, 2.8%, is on +5 day. The t value notifies an insignificant examination result. Thus unlock has a greater impact on individual shares, which renders the cumulative abnormal returns scatter around the average line and suffer from an overlarge standard deviation.

(c) Combining the above two methods, buy long those whose shareholder is the largest and whose unlock ratio is less than 5%, and sell short those whose shareholder is not the largest and whose unlock ratio is more than 5%.

Final results are as follows:

Table 4 results of long-short hedge portfolio according to dual factors

	CAR (-20:-1)	CAR (-20:0)	CAR (-20:+5)
buy long portfolio：largest shareholder & unlock ratio less than 5%			
Average	0.003676	0.009584	0.012248
Standard deviation	0.1564	0.160243	0.172519
sell short portfolio: not largest shareholder & unlock ratio more than 5%			
Average	-0.02456	-0.01859	-0.02487
Standard deviation	0.139084	0.145986	0.169099
overall returns	0.028236	0.028174	0.037118
t value	-0.06279	-0.02008	-0.00021

At this time, the largest abnormal return of the hedge portfolio is on the +5 day and the overall abnormal return is 3.7%. This result is much better than the previous two. However, the result is still insignificant statically as we can see from the t value.

(d) We have also tried tradable stock size, industries as classification criteria. Unfortunately, no significant profit potentials have appeared. What's more, we find that whether the market is bullish or bearish may serves as a proper indicator after we involve unlock date as a variable.

On October 16th, 2007, Shanghai composite index hit an all-time high of 6124. Among the ten stocks with the largest negative cumulative abnormal return and the ten with the largest positive, only one of

them demonstrated obvious negative cumulative abnormal return in bull markets before October, 16th, 2007, while most of them showed impressive positive cumulative abnormal return.

In fact, most negative cumulative abnormal returns surfaced in bear markets for three reasons. First, in bear markets, unlocking brings obvious liquidity adding effect and significant demand elasticity. The advent of the unlocking day brings more chance for a rising price than a supply shock. People want to buy more stocks at this time. Second, in bear markets, shareholders have little motivation to reduce share holdings. They predict that stocks in bear markets are probably going to rise later, so they won't sell their stocks in a hurry. If the market anticipates this point, the problem of supply shock won't arouse too much worry. Third, in bull market, unlocked stocks, once sold, are quickly bought again by larger capital. However, in a bear market, the market is sluggish and the selling strategy has impressive profits. Therefore, shareholders rush to sell their holdings and the stocks slumps.

4. Further discussion

On the whole, it's not a quite satisfactory strategy to utilize a long-short hedge portfolio to obtain abnormal profits, because the most important contributive factor is difficult to observe. If large shareholders sell their shares when the stock is unlocked, the most important factors to be considered can be (1) holding costs (2) development potential of the company (3) cash needs (4) shock costs. Unfortunately, these sorts of information are not accessible through public ways. Information asymmetry largely warps our judgment.

Firstly, the lower the holding costs are, the more motivated shareholders are to sell their shares. Even though non-tradable stock shareholders have to compensate for tradable share holders before they can enter the secondary market and trade the stock legally, unlocked non-tradable stocks still gain an advantage of low holding costs over tradable stocks.

Secondly, development potential of the company is critical to the future share price and shareholders' decisions. This can be seen in recent trend of share prices, which we will discuss later. However, this cannot compensate for the huge information asymmetry between ordinary investors and holders of large and small parts of non-tradable shares. Many companies give out good news with a high voice before the unlocking day to induce ordinary investors to buy those shares, which make us too confusing to tell the truth from the false.

Thirdly, cash needs. If corporate operators encounter a short-term cash need, they might sell their stocks. In this case it is more difficult to judge.

Finally, shock costs. Knowing that unlocking large and small parts of non-tradable stocks certainly impacts stock price the most when the stocks suffers bad liquidity, shareholders of non-tradable stocks might reduce their holdings gradually in batches instead of selling their shares immediately so that their benefits are maximized and the shock costs are minimized.

5. Conclusion

On the basis of financial engineering and modeling, this article conducts empirical tests towards the impact of China's A Stocks' Reform (unlocking the non-tradable stocks) and finding positive and negative abnormal returns under different conditions. We build long-short hedge portfolio according to shareholders and unlocking ratio. Specifically, we buy long those with the largest shareholders and have less than 5% unlock ratio. We sell short those without the largest shareholders and have more than 5% unlock rate. The result shows that we gain an abnormal return of 3.7%.In analyzing the stock samples, we have two findings: (1) Even though the unlocking event does not raise the overall average of cumulative abnormal returns, it intensifies fluctuation of share price and investment risk. (2) Whether the unlocking day is in a bull market has a great impact on the volatility of share price after unlocking event. A bull market can provoke the stock ballooning while a bear market can render the price fall.

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